ORIGINAL

FOURTH FIVE-YEAR REVIEW REPORT

Bally Ground Water Contamination Superfund Site

Borough of Bally

Berks County, Pennsylvania

EPA ID#: PAD061105128

Prepared by:

U.S. Environmental Protection Agency

Region III

Philadelphia, Pennsylvania

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Hazardous Site Cleanup Division

6/5/2015

Date

EXECUTIVE SUMMARY

The Bally Ground Water Contamination Superfund Site (Site) is located in Bally, Berks County, PA, and consists of the former Bally Engineered Structures (BES facility), and a plume of ground water contamination.

The remedy for the Site, as described in the 1989 Record of Decision (ROD), and subsequent EPA decision documents, includes operation of a ground water extraction and air-stripper treatment system; operation of a sub slab depressurization system to address vapor intrusion at the former BES facility; and the installation of a new municipal supply well in an area not contaminated by the Site.

The Site achieved construction completion with the signing of the Preliminary Close-Out Report on May 28, 1999. The trigger for this fourth five-year review was the date of the previous Five-Year Review: June 9, 2010.

The 2015 Five-Year Review finds that the remedy was constructed in accordance with the decisions documents. Based on the results of the Five-Year Review, the remedy is generally operating as intended. After 26 years of operating the remedy, the remedy objective of restoring the aquifer in a reasonable time frame has not yet been achieved. Therefore, a work plan should be developed to optimize the ground water remedy to determine an effective approach to achieve the ground water standards for the plume.

Government Performance and Results Act (GPRA) Measure Review
As part of this Five Year Review the GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators
Human Health: HEPR – Current Human Exposure Controlled and Protective Remedy in Place
Groundwater Migration: GMUC – Contaminated Ground Water Migration under Control

Site-wide Ready for Anticipated Use (SWRAU): The Site has achieved Site-wide RAU on January 29, 2013.

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Acronyms

AOC	Administrative Order on Consent
BES	Bally Engineered Structures, Inc.
BCC	Bally Case and Cooler Company
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CD	Consent Decree
CEC	Civil and Environmental Consultants, Inc.
CSF	Cancer Slope Factor
DCE	1,1-dichloroethene
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
ERM	Environmental Resources Management, Inc.
ESD	Explanation of Significant Differences
FFS	Focused Feasibility Study
MCL	Maximum Contaminant Level
MUN-3	MUN-3
MUN-4	MUN-4
MW	Monitoring Well
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Resources
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
VOC	Volatile Organic Compound

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Bally Ground Water Superfund Site		
EPA ID: PAD061105128		
Region: III	**State:** PA	**City/County:** Borough of Bally, Berks County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Mitch Cron
Author affiliation: EPA Region III
Review period: 2014-2015
Date of site inspection: November 10, 2014, and January 27, 2015
Type of review: Post SARA
Review number: Fourth
Triggering action date: June 9, 2010 (Third Five Year Review)
Due date *(five years after triggering action date)*: June 9, 2015

FIVE-YEAR REVIEW SUMMARY FORM, CONT'D.

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s):	**Issue Category:** Remedy Performance			
	Issue: The VOCs concentrations in the ground water plume have decreased, however, after 26 years of treatment the remedial action objective of restoring the aquifer has not been achieved.			
	Recommendation: Submit a work plan to optimize the ground water remedy to determine an effective approach to achieve the ground water standards for the plume			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/PADEP	June 2016

Protectiveness Statement(s)

The Operable Units for the Site are:
OU-1 Contaminated ground water plume
OU-2 Bally public water system
OU-3 Vapor intrusion

The remedy at OU-1 is protective of human health and the environment because exposure pathways have been eliminated; specifically a ground water extraction and treatment system limits ground water plume migration, institutional controls prevent private wells from being installed into the plume, and down gradient, private wells have not been impacted by the Site. Additionally, discharge from the extraction and treatment system is compliant with a National Pollutant Discharge and Elimination System (NPDES) permit, and is protective of human health and the environment.

The remedy at OU-2 is protective of human health and the environment because exposure pathways have been eliminated; specifically, a municipal supply well has been installed in an area which is not impacted by the Site. Water from the municipal well is not contaminated by the Site ground water contamination plume, and is protective of human health.

The remedy at OU-3 is protective of human health and the environment because exposure pathways have been eliminated; specifically, a vapor intrusion mitigation system has been constructed at the former BES facility which prevents vapor intrusion into occupational work spaces.

U.S. Environmental Protection Agency
Region III
Hazardous Site Cleanup Division
Fourth Five-Year Review Report
Bally Ground Water Contamination Superfund Site
Borough of Bally, Berks County, Pennsylvania

I. Introduction

The purpose of the Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The United States Environmental Protection Agency (EPA or "the Agency") is preparing this Five-Year Review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121, 42 U.S.C. §9621, and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f) (4) (ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

EPA Region III conducted this Five-Year Review of the remedy implemented at the Bally Ground Water Contamination Superfund Site (Site) located in the Borough of Bally, Berks County, Pennsylvania. This review was conducted by the Remedial Project Manager (RPM) for the Site from November 2014 to May 2015. This report documents the results of the Five-Year Review. This is the fourth Five-Year Review for the Site. The triggering action for this statutory review is the date of the third Five-Year Review: June 9, 2010. The Five-Year Review is required because

hazardous substances, pollutants, or contaminants remain at the Site above levels that would allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 lists the chronology of events for the Site.

Table 1: Chronology of Site Events

Date	Event
October 1982	Volatile organic compound contamination was identified in Bally's Municipal Well Number Three (MUN-3), one of three sources of potable water used by Borough of Bally.
December 1982	MUN-3 is disconnected from the Bally water system.
1987	EPA enters into a Consent Order with Bally Engineered Structures, a potentially responsible party for the contamination, to perform a remedial investigation/feasibility study.
October 1987/March 1989	PADEP issues a permit for the operation of a two-stage air-stripper water treatment system at MUN-3. MUN-3 is reconnected to the Bally water system.
June 1989	EPA issues the Record of Decision for the Site.
January 18, 1990	EPA issues an Explanation of Significant Differences No. 1 for the Site, clarifying EPA's position with regard to air emissions from the on-Site air-stripper water treatment system.
July 18, 1991	Consent Decree between EPA and Temrac, Inc. and Sunbeam Oster Company, Inc. entered in Court.
May 28, 1999	EPA issues the Preliminary Close-Out Report for the Site.
February 2003	1,4-dioxane is identified at MUN-3 and in the Bally public water supply.
March/April 2004	Trichloroethylene vapors are identified beneath the building slab of the former Bally Engineered Structures facility, triggering the initiation of a vapor intrusion investigation at the Site.
August 1, 2007	EPA issued a Record of Decision (ROD) Amendment to address the presence of 1,4-dioxane in the Bally public water supply. The ROD Amendment required the installation of a new municipal supply well, the preparation of a contingency plan, and updating the ground water monitoring program.
October 16, 2008	EPA and a Potentially Responsible Party entered into an Administrative Order on Consent for the performance of a Removal Action to address vapor intrusion of Site-related

	hazardous substances into two tenant spaces at the former Bally Engineered Structures facility.
March/April 2009	Construction of a sub slab depressurization (SSD) system, performed as part of a Removal Action to address vapor intrusion at the former Bally Engineered Structures facility substantially completed.
2010	Construction of new municipal supply well completed ("MUN-4"), and connection to Bally public water supply completed. MUN-3 disconnected from the Bally public water supply.
May 23, 2011	ESD No. 2 issued by EPA, requiring construction of a discharge pipeline from MUN-3 directly to the West Branch of the Perkiomen Creek.
January 2013	Discharge pipeline completed.

III. Background

Physical Characteristics

The Site is located on a 19-acre parcel north of the intersection of North Front Street and Old Route 100 in the Borough of Bally, Berks County, Pennsylvania. The Site consists of the former Bally Engineered Structures ("the BES facility") and a plume of ground water contamination originating from the former BES facility. As depicted on Attachment 1, the BES facility is located nearly directly north of the intersection of Route 100 and Old Route 100.

Facility

The former BES facility was an industrial production plant that operated between the 1930's and approximately 1995 and manufactured insulated containers. Operations ceased in 1995 and the property was sold and the facility was subdivided for use by several businesses. The facility is now occupied by a variety of commercial and light industrial businesses (Attachment 1)

Ground Water Contamination Plume

A Site-related ground water contamination plume lies beneath a portion of the Borough of Bally. The ground water contamination plume is present between the former BES facility and MUN-3. The plume extends to the east, down gradient from the BES facility and MUN-3 and consistent with ground water flow direction, for approximately 2,400 feet. Based on the most recent Remedial Action Progress Report, dated December 8, 2014, the direction of ground water flow at the Site is generally east. As presented on Attachment 5, monitoring well cluster 97-23I and 97-23D represents the down gradient edge of the plume. The ground water plume exhibits Site-

related volatile organic compounds (VOCs), including trichloroethylene, and 1,4-dioxane, which are two of the main contaminants in the plume.

A map depicting the location of the former BES facility is included as Attachment 2. A figure depicting the location of Site ground water monitoring wells is included as Attachment 3. A figure depicting the most recent ground water monitoring data for the Site, is included as Attachment 4 and Attachment 5.

Land and Resource Use

Land use in the vicinity of the Site is primarily residential, with commercial and industrial properties present, as well as parks, recreation fields and local government facilities. The Borough of Bally covers 330 acres and has a population of approximately 1000 people.

The geologic unit encompassing most of the Site is the Brunswick Formation, with the Leithsville Formation. The Site is underlain by a single, thick, unconfined (or locally semi-confined) aquifer that occurs within the limestone fanglomerate and overlying residuum. Transmission of ground water is principally controlled by fractures and joints.

The aquifer underlying the Site is currently used as a drinking water source for residents in the Borough of Bally and adjoining Washington Township. The drinking water supply for the Borough of Bally and a portion of Washington Township is currently a municipal supply well located outside of the Borough limits which supplies water to the Bally public water system, and is identified as MUN-4. MUN-4 was constructed in 2010 to provide a safe source of public drinking water that was not affected by the Site's ground water contamination.

It should be noted that "MUN-3", the Borough's former municipal supply well, was disconnected from the Bally public water supply in 2010. MUN-3 currently acts as the extraction well for the ground water extraction and treatment system, and is equipped with an air-stripper, which removes contaminants from the water prior to discharge of the treated water to the West Branch of the Perkiomen Creek, in accordance with a National Pollutant Discharge Elimination System (NPDES) permit.

Residents of Washington Township, who live outside of the Borough of Bally, use private wells for domestic water.

History of Contamination

In 1982, the Bally Municipal Water Authority conducted a water quality check of the Bally water system and discovered the presence of elevated concentrations of VOCs in MUN-3. The principal VOCs identified in the impacted aquifer were 1,1,1-trichloroethane (1,1,1-TCA), trichloroethylene (TCE), and 1,1-dichloroethene (1,1-DCE). A survey conducted in 1983 by the Pennsylvania Department of Environmental Resources (PADER, now the Pennsylvania

Department of Environmental Protection (PADEP)) indicated that the BES facility was a potential source of the VOC contamination.

The BES facility was located immediately to the west/southwest of MUN-3. BES constructed insulated structures and structural panels. Bally Case and Cooler Company (BCC), the predecessor of BES, manufactured wood products in the 1930's and manufactured insulated meat display cases and insulated panels in the 1950's. BCC used degreasing agents to clean metal surfaces and to ensure a good bond with the foam insulation.

Initial Response

As mentioned above, VOC contamination was identified in MUN-3 in October 1982. As a result MUN-3 was disconnected from the Bally water system in December 1982. A water treatment system, consisting of two air-stripper towers, was constructed in the 1988 -1989 time frame to treat water from MUN-3. MUN-3 was then reconnected to the Bally water system in 1989.

In 1987, EPA entered into a Consent Order with BES, a potentially responsible party (PRP) for the Site, to conduct a study on the nature and extent of contamination and to evaluate cleanup alternatives.

Basis for Taking Action

The Final Phase III Remedial Investigation (RI) Report is dated May 1989. The results of the RI are summarized as follows:

Impacts to Ground Water

VOCs were detected in 13 monitoring wells, the two municipal wells, three of the industrial wells, and one residential well. The deeper portion of the plume, present in bedrock, was much larger in horizontal extent and exhibited higher concentrations of VOCs. The extent of the deep portion of the plume, as mapped in the RI, extended from the BES facility, to the northeast as far as Municipal Well Number One (MUN-1), and to the southeast. MUN-1 is located directly north of the intersection of Main Street and North Seventh Street in Bally. A map depicting the streets of Bally is included as Attachment 3.

Impacts to Surface Water

Contaminants were identified in a surface water sample and sediment sample collected from an unnamed tributary located downstream from the former BES facility. The surface water VOC concentrations were found to be below applicable criteria for the protection of aquatic biota.

Sources of contamination at the former BES facility

It was concluded that the ground water contamination plume associated with the Site is a result of historic release from the former BES facility from such operations as the former degreasing area, small parts degreasing area, northern and southern lagoon areas, and northern perimeter of the former BES facility.

IV. Remedial Actions

Remedy Selection

EPA issued several decisions documents to select the remedy for the Site. For contaminated ground water (OU-1), EPA has issued a ROD and two Explanations of Significant Differences. For the Bally public water supply (OU-2), EPA issued a ROD Amendment. For (vapor intrusion (OU-3), EPA issued an Administrative Order on Consent (AOC) to implement the work. These decisions documents and the AOC are discussed further below.

Operable Unit One (OU-1) – Contaminated ground water plume

On June 30, 1989, EPA signed the ROD, which selected a remedy for the Site. The remedy focused on closing contaminated private wells and treating groundwater contamination by the following components:

- Abandoning appropriate existing private wells and implementing institutional controls on the use of operable private wells and the construction of new wells.
- Performing ground water and surface water monitoring to measure contaminant concentrations and migrations affected by removing contaminated ground water from the aquifer through the continuous pumping of MUN-3.
- Treating the extracted ground water by one of the treatment options retained for consideration and discharging the treated water from MUN-3 to the adjacent stream or into the Borough of Bally potable water system as needed to provide a suitable alternative water supply.
- Performing necessary additional studies in the pre-design phase to evaluate the configuration of any additional ground water extraction well(s) required.

The remedial action objectives outlined in the ROD for the cleanup of the Site are:

- Prevent current and future ingestion of ground water containing unacceptable levels of VOCs.
- Restore the aquifer within a reasonable time frame to a condition such that levels of the VOC contaminants of concern are below remediation levels consistent with its use as a Class II aquifer.

The performance standards which are to be met by implementing the remedy are based on a PADEP Municipal Water Supply Permit and Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs). The performance standards for discharge of treated ground water from the air-stripper to surface water are based on a PADEP NPDES permit to ensure that the discharge or effluent meets the water quality standards to protect the creek. The ground water remediation performance standards are included as Attachment 6.

On January 18, 1990, EPA issued an Explanation of Significant Differences (ESD No. 1) to further clarify the air emissions controls from the air stripper as follows:

- Air emission controls are no longer required irrespective of emission levels. The need for air controls is now dependent upon contaminant levels emitted from the air-stripper. Specifically, air emissions must be controlled such that the combined emissions from all Site-related air-strippers shall not exceed three pounds per hour during any one hour and fifteen pounds per day during any twenty-four hour period.
- Air stripping without air emission controls (ROD process option 2C) may be retained for consideration if, and only if the combined emissions from all site-related air-strippers do not exceed the levels stated in the previous paragraph.
- EPA reserves the right to determine the appropriate number of Site recovery wells and the appropriate design and location for all recovery wells. EPA will also control the withdrawal pumping rate of these wells. The emissions generated under the EPA approved design and operating specifications will in turn dictate the need for air emission controls.

In 2011, EPA issued a second ESD (ESD No. 2). This second ESD required that the discharge location of the treated ground water from MUN-3 be changed from an unnamed tributary of the West Branch of the Perkiomen Creek to the West Branch of the Perkiomen Creek. EPA determined that the effluent which contained 1,4-dioxane could be discharged to the West Branch of the Perkiomen Creek pursuant to the NPDES permit and would be meet the NPDES permit effluent limits without further treatment. The air-stripper was designed to treat VOCs such as TCE and other contaminants but 1,4-dioxane is not treated by the air-stripper.

Operable Unit Two (OU-2) – Bally public water supply

A contaminant, 1,4-dioxane, was identified in the Bally public water supply in February 2003. To address this contaminant, EPA and the PRP entered into an Administrative Order on Consent (AOC) on September 30, 2003 (2003 AOC). The 2003 AOC required, among other work items, that the PRP prepare a Focused Feasibility Study (FFS) to address the presence of 1,4-dioxane in the Bally public water supply, and that users of the Bally public water supply be provided with bottled drinking water.

To respond to the 1,4 dioxane in MUN-3 and in the Bally public water supply, EPA issued a

Record of Decision Amendment on August 1, 2007 (ROD Amendment). The ROD Amendment consisted of the installation of a new municipal supply well in a location not impacted by the Site; connection of the new municipal well to the Bally public water supply; disconnection of MUN-3 from the public water supply; and preparation of a contingency plan and ground water monitoring program to prevent the ground water contamination plume from impacting the new municipal supply well, and to mitigate impacts to local domestic wells from operation of the new municipal supply well.

Operable Unit Three (OU-3) – Vapor Intrusion

Between approximately 2004 and 2007, an investigation of vapor intrusion was performed at the Site. The investigation was performed at the former BES facility and at townhome properties that lie between the former Bally facility and MUN-3, and are underlain by the most contaminated portion of the ground water plume. Based on the investigation EPA determined in 2005 that no further action was necessary to address vapor intrusion at the townhome properties. Vapor intrusion was occurring into two tenant spaces at the former BES facility at levels of potential concern. As a result, on October 16, 2008 EPA and a PRP entered into an Administrative Order on Consent (2008 AOC) to address vapor intrusion at the Site. The 2008 AOC included specific work items to address vapor intrusion at the former BES facility including to design, construct, and operate a mitigation system to reduce indoor air concentrations of Site-related hazardous substances in the tenant spaces.

Remedy Implementation

As indicated above, the remedy for the Site consists of numerous elements described in a ROD, a ROD Amendment, two Explanations of Significant Differences, and an AOC. The implementation of the individual elements of the remedy are discussed as follows:

Well Abandonment

A private well referenced in the ROD was not permanently closed. As a result the PRP closed the private well on March 7, 2006. Well closure documents were included in the 2010 Five-Year Review Report.

Institutional Controls

The Borough of Bally passed an ordinance on November 4, 2002, Ordinance #250 – Water & Sewer which serves as an institutional control at the Site. All water users located in the Borough of Bally, and situated so that water service is available, must connect to the Bally water system. In addition the ordinance indicates that no private wells may be drilled in the Borough without applying for a permit from the Borough of Bally. The permit application would be reviewed by the Borough Engineer in cooperation with PADEP. The ordinance specifically indicates that a

permit for a new private well in Bally will not be issued if it is determined that the installation of such a well would adversely impact the remedial action being performed at the Site.

Ground water extraction and treatment

An air-stripper was installed at MUN-3 so that VOCs could be removed from contaminated ground water prior to distribution in the Bally water system. The first air-stripper tower received a Public Water Supply Permit (No. 0687505) to operate from PADEP on October 28, 1987. The second air-stripper tower received an amendment to the Public Water Supply Permit to operate from PADEP on March 24, 1989. Operation of MUN-3 as the extraction well for the ground water extraction and treatment system is on-going.

Selection of additional extraction wells and Ground water and surface water monitoring

EPA entered into a Consent Decree (CD) with Temrac, Inc. and Sunbeam-Oster Company, Inc. (PRPs) to implement the requirements of the 1989 ROD. The CD was entered by the court on July 18, 1991. Since the air-stripper at MUN-3 was constructed before the issuance of the ROD, the primary activity to be addressed during the remedial design (RD) was to determine whether or not additional extraction wells would be required to address the ground water contamination plume.

When access was obtained in August 1998, two monitoring wells were installed. These wells are identified as 97-32I and 97-23D, and were constructed to collect ground water samples from the shallow portion and deep portion of the bedrock aquifer, respectively. Ground water samples collected from these wells in October 1998 did not reveal contaminant concentrations in excess of the ROD performance standards. Based on this information, EPA determined that the installation of additional extraction wells in the Southern Area of the plume was not necessary. This determination was documented by EPA in a letter to a consultant for the PRP dated March 26, 1999.

EPA documented construction completion for the remedy selected in the ROD when the Preliminary Close-Out Report was signed on May 28, 1999.

New Municipal Well

The new municipal well, MUN-4, was constructed in 2010 to be the municipal water supply source for the Bally public water system. This Remedial Action described in the 2007 ROD Amendment was performed by the PRP in accordance with the 1991 CD. The Remedial Design was approved by EPA in September 2009. The Remedial Action included construction of the well house and necessary mechanical improvements at the new municipal well location, and installation of a water line between the new municipal supply well and the Bally public water supply. The remedial action was completed during 2010.

Vapor Intrusion

Construction of a sub slab depressurization (SSD) system was completed in April 2009 based on a Response Action Plan prepared by Arcadis U.S. Inc. and approved by EPA on December 23, 2008. Air monitoring is being performed at the former BES facility in accordance with the 2008 AOC and the Response Action Plan. Indoor air monitoring is performed to verify that the operation of the SSD reduces indoor air concentrations of Site-related hazardous substances to acceptable levels in tenant spaces within the former BES facility. On-going indoor air monitoring will continue to be performed by the PRP and overseen by EPA.

MUN-3 Discharge pipeline

A discharge pipe was constructed from MUN-3 to the West Branch of the Perkiomen Creek. The pipe was constructed between December 2011 and January 2012. Construction of the pipeline was documented in a Remedial Action Completion Report dated January 22, 2013. The Remedial Action Completion Report was approved by EPA on June 14, 2013.

System Operation/Operation and Maintenance

The current remediation system for the Site consists of the primary extraction well (MUN-3), the two-stage air-stripper connected to MUN-3, and a monitoring program which includes effluent sampling from the air-stripper as well as ground water monitoring. In addition, a sub slab depressurization (SSD) system is operated and maintained at the former BES facility to address vapor intrusion.

Air-stripper Operation and Maintenance and Monitoring

The air-stripper connected to MUN-3 is operated and maintained by contractors for the PRP. Effluent from the air-stripper is sampled approximately four times per month, prior to discharge of the treated water to the West Branch of the Perkiomen Creek in accordance with a NPDES permit. Monitoring is to verify that the discharge from the pipe to the West Branch of the Perkiomen Creek is protective of the environment and is performed in accordance with a Stream Monitoring Plan, dated December 13, 2011.

Ground Water Monitoring

The PRP currently performs ground water monitoring at the Site. A number of monitoring wells are sampled by the PRP to evaluate the progress of remediation of the ground water contamination plume, and to verify that the ground water contamination plume is not migrating toward private wells, or Bally's public water supply source (MUN-4). Ground water samples are analyzed for 1,1,1-TCA, TCE, 1,1-DCE and 1,4-dioxane. A table from the Remedial Action Progress Report, dated December 8, 2014, identifying the monitoring well sampling schedule is included as Attachment 7 to this Five-Year Review Report. A drawing identifying the location of the sampled

monitoring wells is included as Attachment 3.

Sub slab Depressurization System Operation and Maintenance/Monitoring

Monitoring of the SSD includes indoor air monitoring at the former BES facility; vacuum monitoring beneath the slab of a portion of the former BES facility to evaluate the extent to which sub slab depressurization is being exerted by the SSD; and monitoring of effluent from the SSD. Indoor air samples are collected annually from within the former BES facility to verify the protection of the workers within the facility. Operation and maintenance inspections are conducted quarterly, and include sub slab vacuum monitoring, and monitoring of effluent from the SSD.

Public Water Supply Well (MUN-4)

MUN-4 was constructed to be the Borough's public water supply well. The Borough of Bally is responsible for operation and maintenance of MUN-4.

V. Progress Since the Last Five-Year Review

This is the fourth Five-Year Review for the Site. The third Five-Year Review for the Site was issued on June 9, 2010. The third Five-Year Report made the following conclusions regarding the Site:

"The ground water remedy has been operating for approximately 21 years (1989 – 2010). Current contaminant concentrations at the Site extraction well are similar to 1989 contaminant concentrations, and progress towards achieving the remedial action objective of restoring the contaminated aquifer has been limited. Therefore, optimization of the ground water remedy should be performed."

To date, the PRP has made efforts to improve operational efficiency at MUN-3, and they have implemented upgrades to allow the extraction well and air-stripper treatment to operate more effectively during extreme cold weather. The PRP is currently evaluating other optimization opportunities associated with the treatment system and groundwater monitoring program including sampling locations and frequency.

VI. Five-Year Review Process

Administrative Components

Members of the local government of the Borough of Bally, the Project Coordinator (employee of Arcadis U.S. Inc.), and PADEP were notified of the initiation of the Five-Year Review.

The Five-Year Review Team was led by the EPA Remedial Project Manager (RPM) for the Site. The review team established the review schedule which included: Community Involvement; Document Review; Data Compilation and Review; Site Inspection; Local Interviews; and Five-Year Review Report Development and Review.

Community Involvement

The public in the vicinity of the Site was notified about the Five-Year Review by an advertisement in the Boyertown Area Times newspaper on February 19, 2015. The Boyertown Area Times newspaper is based out of Boyertown, Pennsylvania and serves the community in the vicinity of the Site.

EPA interviewed the following individuals: members of the Bally Borough local government, PADEP Project Manager, PRP Project Coordinator, to involve the community in the Five-Year Review. During the interviews, representatives of EPA summarized the findings of the Site inspection and asked for any concerns about the remedy.

Document Review

This Five-Year Review consisted of a review of relevant documents and reports including:

- Remedial Action Progress Report, dated December 8, 2015
- Discharge Monitoring Report, 2010-2015
- Analytical result for an "emerging contaminant" identified as tris(1,3-dichloroisopropyl)phosphate at MUN-3.
- Interim Status Report – Bally Well #3 Discharge Stream Monitoring, dated December 4, 2014
- Revised Air Emission Evaluation, dated October 3, 2013
- Water quality data for MUN-4, provided by PADEP in emails dated January 13, 2015 and March 16, 2015.
- Annual Vapor Intrusion Mitigation Report, 2014
- Indoor air data collected by the PRP at EPA's request from the former Bally Engineered Structures facility, issued to EPA by PRP March 2015

<u>Ground Water</u>

Review of the ground water monitoring data included in the Remedial Action Progress Report (dated December 8, 2014) reveals that a ground water plume exists beneath a portion of the Borough of Bally.

The ground water contamination plume is present between the former BES facility and MUN-3. The plume extends to the east, down gradient from the BES facility and MUN-3 and consistent

with ground water flow direction, for approximately 2,400 feet. As presented on Attachment 5, monitoring well cluster 97-23I and 97-23D represents the down gradient edge of the plume. TCE, 1,1,1-TCA, 1,1-DCE, as well as 1,4-dioxane are detected in the ground water plume.

In sampled wells, MUN-3, the Site extraction well, exhibits the highest contaminant concentrations. For example, in October 2014, the following contaminant concentrations were detected in MUN-3:

Contaminant	Concentration (ppb)	Performance Standard (ppb)
TCE	389	5
1,1,1-TCA	255	200
1,1-DCE	251	7
1,4-dioxane	61	3

Basically, the ground water remedy consists of one extraction well (MUN-3) which is used to extract contaminated ground water from the plume for treatment by a two-stage air-stripper. Review of the RI report reveals that a ground water sample collected from MUN-3 in 1989 exhibited a total VOC concentration of 1,390 parts per billion (ppb). Review of the Remedial Action Progress Report indicates that total VOC concentrations in MUN-3 during October 2014 were approximately 956 parts per billion.

A summary of ground water contamination concentrations included in the Remedial Action Progress Report is included as Attachment 4 and Attachment 5. Generally, contaminant concentrations in monitoring wells down gradient from MUN-3 (e.g. 92-17, 92-18I, 92-20I, etc.) are much lower relative to MUN-3.

During the performance of the Five-Year Review, EPA requested that the PRP analyze for an "emerging contaminant" identified as tris(1,3-dichloroisopropyl)phosphate (TDCPP). TDCPP was not detected in MUN-3. This emerging contaminant was considered by EPA to be of potential concern as TDCPP is associated with foam products, and foam was used as an insulating material in walk in freezers manufactured on-Site.

Surface Water

Site-related contaminants have the potential to enter surface water via two routes: seepage of contaminated ground water to unnamed tributaries of the West Branch of the Perkiomen Creek and discharge from the air-stripper to an unnamed tributary of the West Branch.

Effluent water from the air-stripper facility is discharged to the West Branch via an underground pipe. EPA reviewed discharge monitoring reports (DMRs) from 2010 through 2015. Review of the DMRs reveals that the discharged water complies with the effluent limit in the NPDES permit.

For example, the January 2015 "Supplemental Report Daily Effluent Monitoring" was reviewed

by EPA. This document indicates the following average concentrations of contaminants were detected in the MUN-3 discharge to the West Branch of the Perkiomen Creek:

Contaminant	Average discharge value (ppb)	Effluent Limit (ppb)
1,4-dioxane	68	112
1,1,1-TCA	<0.27	Monitor and Report
Chloroform	<0.15	213
Methylene Chloride	1.3	None listed
Tetrachloroethylene	<0.26	30
TCE	<0.21	101

On-going stream monitoring is performed by the PRP to verify that the discharge pipe is protective of the environment. Stream monitoring includes monthly surface water monitoring and annual habitat assessments. Stream monitoring activities performed to date were provided to EPA by the PRP in the "Interim Status Report – Bally Well #3 Discharge Stream Monitoring", dated December 4, 2014. The report indicated that stream monitoring to date has verified that discharge from MUN-3 directly to the West Branch is protective of the environment.

Air Emissions

The air-stripper treatment system and the vapor intrusion mitigation system both act as sources of VOC emissions to the air. In order to verify that such air emissions are protective of human health, the PRP prepared a Revised Air Emissions Evaluation, dated October 3, 2013. This document estimated possible concentrations and risks from the emissions of the SSDS and the air stripper, and was reviewed by the EPA.

The long-term concentrations modeled from these air emissions were compared to EPA's Regional Screening Levels (RSLs), and were found to be within the acceptable range (cancer risk 1E-6 to 1E-4, and a Hazard Index equal to 1 or less).

The highest acute (24-hour) concentration of TCE modeled from the air stripper stacks was 2.49 ug/m3, which very slightly exceeded the RSL at a Hazard Quotient of 1 (2 ug/m3). The screening level for TCE is technically chronic, but is actually based on the potential for fetal cardiac malformations. This critical effect can occur during a short window of fetal development (about 3 weeks), with an uncertainty factor of about 10, and thus is reasonable to consider in comparison to the acute concentration. According to the model, this acute concentration would be in a localized area near the air-stripper, with lower concentrations, below levels of concern, predicted elsewhere.

Essentially, since HQs only contain one significant figure, the HQ associated with this concentration would still be 1. Given this fact, along with the uncertainty factor in the RSL, the uncertainty inherent in modeling, and the unlikelihood of a receptor occupying the highest-concentration spot for any length of time, EPA concluded that the emissions were within the acceptable range.

MUN-4

Based on the water quality data provided by the PADEP for MUN-4 and based on ground water monitoring performed by the PRP in locations between the new municipal supply well and the ground water contamination plume, the remedial action continues to be protective of human health because the water being consumed by the community is not impacted by Site-related contaminants. MUN-4 is regulated by the PADEP subject to the Safe Drinking Water Act (SDWA). PADEP provided water quality results from 2010 to 2014 for MUN-4 for trichloroethylene (TCE) and 1,4-dioxane, two of the main ground water contaminants. The 1,4-dioxane results were reported as "0" by PADEP for 2012, 2013, and 2014. For TCE, PADEP provided eight sample results from 2010 through 2014; in each case the TCE result was reported as "0". PADEP confirmed during the FYR that the laboratory detection limits for 1,4-dioxane and TCE were below safe drinking water limits.

Further, ground water monitoring at "sentry" monitoring wells is performed by the PRP to verify that the ground water contamination plume is not migrating toward MUN-4. For example, ground water monitoring at monitoring well "MW-04" between 2010 and 2014 did not reveal Site related contamination between the ground water contamination plume and MUN-4, with the exception of three estimated detections of 1,4-dioxane which were each estimated at less than 1 part per billion. The location of MW-04 is depicted on Attachment 3.

Indoor air at former Bally Engineered Structures facility

Two indoor air samples are collected annually at the former BES facility to verify that the vapor intrusion mitigation remedy is protective of human health. Review of the 2014 Annual Vapor Intrusion Mitigation Report, dated June 2014, reveals that the indoor air samples exhibited low concentrations of 1,1-DCE, 1,1,1-TCA, and TCE. To evaluate these concentrations for protection of human health, EPA compared the concentrations of 1,1-DCE, 1,1,1-TCA, and TCE to EPA RSLs. Only TCE exceeded its RSL of 0.9 micrograms per cubic meter; therefore, further evaluation of TCE was performed by EPA. The indoor air level of concern for TCE in a work-place setting is approximately 8.8 micrograms per cubic meter. The indoor concentration of TCE detected was 3.3 micrograms per cubic meter, below the level of concern for TCE. Therefore, EPA determined that indoor air concentrations in the former BES facility were protective of human health.

In addition to the two annual indoor air sampling locations, EPA requested that the PRP collect additional samples within the former BES facility during the performance of the Five-Year Review. The purpose of the additional indoor air sampling was to verify protection of human health in areas of the facility where the vapor intrusion mitigation system is operating and locations where there is no mitigation. In particular the sampling focused on areas in the facility that were built above the former lagoons. Review of the indoor air sampling data collected during January 2015, reveals that the indoor air samples exhibited low concentrations of 1,1,1-

TCA. All of the 1,1,1-TCA detections (the highest concentration detected was 3.2 micrograms per cubic meter) were well below the industrial air Regional Screening Level for 1,1,1-TCA of 2,200 micrograms per cubic meter. Therefore, EPA concluded that the indoor sample results confirmed protection of human health.

Site Inspection

Site inspections were performed on November 10, 2014 and January 27, 2015 by Mr. Mitch Cron, EPA RPM. The purpose of the inspections was to assess the protectiveness of the remedy. The Site visits included a review of the former BES facility, MUN-3 and the air-stripper, and the SSD system. These elements of the remedy appeared to be functioning properly. The Site inspection did not identify concerns pertaining to the selected remedy.

Interviews

The following individuals were interviewed during the performance of the Five-Year Review:

Bally – Local Government officials: The Borough Manager, a member of the Borough Council, and the Borough Engineer met with the RPM to discuss the remedy implemented at the Site. Generally, the Borough of Bally expressed significant concerns regarding the remedy. The Borough has two basic concerns:

1. The Borough expressed significant concern to EPA that the cost associated with operation and maintenance of MUN-4 was exorbitantly high. For example, the Borough informed EPA that the MUN-4 well pump had recently required replacement, at a significant cost to Bally. The Borough expressed concern that such mechanical equipment required replacement after only five years of operation. EPA noted and understood the nature of the Borough's concern, especially with regard to the well pump which required replacement. Further discussion of the Borough's expressed concerns are included in Section 7, below.

2. The Borough expressed significant concerns to EPA that because the Borough of Bally relies upon one sole well for its public water supply, and from the Borough's perspective does not have adequate back-up water supply in case of an emergency that lasts more than 24 hours. Currently the Borough uses a water reservoir containing approximately 24-hour worth of drinking water as the back-up water supply when MUN-4 is taken off line for repairs, maintenance work, etc. Further discussion of the Borough's expressed concerns are included in Section 7, below.

PADEP Project Officer: The PADEP Project Officer expressed no specific concerns with regard to the response actions being implemented at the Site. The PADEP Project Officer requested more frequent communications and updates from EPA on status of the Site. The EPA RPM noted this request.

Project Coordinator: The Project Coordinator (who coordinates PRP-led response actions at the Site) and the EPA RPM discussed the status of Superfund response actions at the Site. The Project Coordinator did not express specific concerns with regard to response actions being implemented at the Site.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended because contaminated ground water is being extracted and treated by MUN-3, a ground water monitoring program monitors the impacts of ground water extraction and treatment on the plume, a new municipal supply well has been installed for the Borough of Bally that provides drinking water, and a vapor intrusion mitigation system has been constructed at the former BES facility which protects workers within impacted areas of the facility.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?

There have been many changes to factors such as toxicity data and cleanup levels, however, even considering all these changes the remedy remains protective.

Changes in Standards and TBCs: Have they been revised and, if so, could this call into question the protectiveness of the remedy?

When the ROD was issued there was no MCL for methylene chloride and 1,2-dichloroethane (1,2-DCA). Since then Methylene chloride has an MCL of 5 ug/L, and 1,2-DCA has an MCL of 5 ug/L. The MCLs for TCE, 1,1,1-TCA, tetrachloroethene (PCE), and 1,1-DCE have not changed. A cleanup goal of 3 ug/L for 1,4-dioxane was later established in an Administrative Order on Consent as a concentrations of 1,4-dioxane in drinking water that is protective of human health.

The following comparison of several Site-related contaminants in ground water, and their respective ground water remediation standards are provided for context (October 2014 sampling event at MUN-3):

Contaminant	Concentration (ppb)	Performance Standard (ppb)
TCE	389	5
1,1,1-TCA	255	200
1,1-DCE	251	7
1,4-dioxane	61	3

The protectiveness of the remedy is dependent upon the protectiveness of the cleanup standards.

As described below, EPA has evaluated the cleanup standards for the Site, and has determined that the cleanup standards are protective of human health. For groundwater, these standards were as follows: TCE, 5 ug/L; 1,1,1-TCA, 200 ug/L; PCE, 5 ug/L; 1,1-DCE, 7 ug/L; 1,1-DCA, not specified; methylene chloride, 5 ug/L; 1,2-DCA, not specified; 1,4-dioxane, 3 ug/L (in a 2003 Administrative Order on Consent). If these concentrations, along with the current MCL of 5 ug/L for 1,2-DCA, were achieved, then the risks could be estimated using current risk assessment methodology and assumptions. At these concentrations, the total cancer risk would be 2E-5 and the Hazard Index would be 0.7 for the child and 0.7 for the adult. Therefore, the cleanup standards are within the 1E-4 to 1E-6 cancer risk goal, and they meet the non-cancer goal of a Hazard Index at or below 1.

Since the ROD, there have been a few changes in land use, as well as new knowledge about site conditions, exposure routes and contaminant sources. An additional contaminant, 1,4-dioxane, was newly identified as described above, and another emerging contaminant was suspected. These issues are discussed below.

New residences were built near the industrial facility after the ROD, and these houses were studied by EPA for evidence of vapor intrusion in 2005. EPA did not find significant vapor buildup beneath the slabs of these local townhouses. In November 2014, EPA reexamined the townhouse data to determine whether updates in TCE toxicity factors since 2005 would lead to different conclusions about the townhouses today. EPA found that risks estimated from the 2005 data would still be within acceptable ranges. EPA noted during the Five Year Review that sub slab sampling methods for vapor intrusion have been refined since 2005, however, at this time EPA does not believe re-sampling of the townhouses is warranted. EPA will continue to review and evaluate this conclusion as remediation of the ground water contamination plume continues.

The industrial facility, which is now divided into space used by several different companies, was also studied for vapor intrusion. EPA did find unacceptable concentrations of vapors accumulating beneath the slab and migrating into indoor air in the former BES facility, which is not being reused by small businesses. As a result, the PRP installed a vapor mitigation system at the facility. The PRP has continued to maintain and monitoring this system under EPA oversight. Based on the data over time and data from January 2015, EPA finds that the indoor air concentrations reached and have remained within acceptable risk ranges.

The installation of the depressurization system does mean that vapors are now vented to ambient air instead of being allowed to accumulate within the building. Until recently, those air emissions underwent filtration by granular activated carbon (GAC) before release. In 2014, the PRP proposed removing GAC treatment from this emission source, based on the reduction in vapor concentrations over time; risk estimates showing that concentrations in the untreated emissions would meet acceptable levels; and the resulting reduction in GAC waste. EPA accepted this proposal, while requesting continued verification that conditions would remain protective.

Another source of air emissions is the release from the air stripper, which treats the groundwater

by removing VOCs from the water and dispersing them into the air. EPA has evaluated those emissions periodically, most recently in 2014, concluding that the modeled emissions appear to represent acceptable concentrations overall. If emissions do not increase, if new receptors are not introduced, and if the toxicity factors for the relevant contaminants (mainly TCE) do not change, the risks should remain within acceptable levels. However, EPA recommends confirming this periodically by evaluating the emissions at five-year reviews, or upon any change in conditions.

In examining the site history for emerging chemicals, EPA identified TDCPP as a potential contaminant based on its connection with urethane foams. Therefore, MUN-3 influent was sampled for TDCPP and it was not detected.

EPA also rechecked the quarterly surface water samples from 1997-1998 in light of updated toxicity factors. Data were screened using tap water RSLs x 10 (a common screening procedure for surface water, since its exposure is assumed to be at least 10X less than exposure to drinking water). All concentrations were below screening levels except for TCE. TCE then received further evaluation using the RSL recreational calculator with default inputs (plus conservative assumptions of 90 days/yr., 4 hrs. /day, exposure), and was found to be within the acceptable risk range. Current surface water conditions are managed under the NPDES permit.

Changes in Exposure Pathways: Has land use or expected land use changed? Have new routes of exposure or receptors been identified? Are there newly identified contaminants or contaminant sources? Are there unanticipated toxic byproducts of the remedy? Have physical conditions or the understanding of those conditions changed? For each of these, how is the protectiveness of the remedy affected?

As part of the Five Year Review, the PRP provided EPA with an updated tenant list for the former Bally Engineered Structures facility. Changes in facility use that would constitute a concern for protectiveness of the vapor intrusion remedy at that location were not noted.

Changes in Toxicity and Other Contaminant Characteristics: Have they changed and, if so, could this call into question the protectiveness of the remedy?

Some toxicity values have changed since 1989. However, the protectiveness of the remedy in groundwater is driven by the cleanup goals, and their protectiveness was discussed above. Risks from other sources (vapor intrusion, emissions from the depressurization system, air stripper emissions) were found to be acceptable under current conditions, as discussed above.

Changes in Risk Assessment Methods: Have methods changed and, if so, how does this affect the protectiveness of the remedy?

New risk assessment guidance has been introduced since 1989. However, the protectiveness of the groundwater cleanup goals and other sources of risk (vapor intrusion, emissions from the depressurization system, air stripper emissions) was evaluated and confirmed using current

methodology, as discussed above.

Expected Progress Toward Meeting RAOs: Is the remedy progressing as expected?

The first Remedial Action Objective in the ROD, is as follows: "Prevent current and future ingestion of groundwater containing unacceptable levels of VOCs." The first Remedial Action Objective has been achieved by installation of a new municipal supply well in an uncontaminated location, and implementation of institutional controls which prevent installation of wells in the area of the ground water contamination plume.

The second Remedial Action Objective in the ROD, is as follows: "Restore the aquifer within a reasonable time frame to a condition such that levels of VOC contaminants of concern are below remediation levels consistent with its use as a Class II aquifer." The second Remedial Action Objective has not yet been achieved by implementation of the selected ground water remedy. The ground water remedy has been operating for approximately 26 years (1989 – 2015). Basically, the ground water remedy consists of one extraction well (MUN-3) which is used to extract contaminated ground water from the plume for treatment by a two-stage air-stripper. Review of the RI report reveals that a ground water sample collected from MUN-3 in 1989 exhibited a total VOC concentration of 1,390 parts per billion (ppb). Review of the Remedial Action Progress Report indicates that total VOC concentrations in MUN-3 during October 2014 were approximately 956 parts per billion. Based on this rate of cleanup, it may take an extended period of time to achieve the second Remedial Action Objective by continued implementation of the Selected Remedy.

With regard to optimization of the ground water remedy, the PRP has made efforts to improve operational efficiency at MUN-3, and has implemented upgrades to allow the extraction well and air-stripper treatment to operate more effectively during extreme cold weather events. Also, the PRP is currently evaluating other optimization opportunities associated with the treatment system and groundwater monitoring program (sampling locations and frequency, etc.). In addition, to these efforts, a work plan should be developed to optimize the ground water remedy to determine an effective approach to achieve the ground water standards for the plume.

With regard to vapor intrusion, the 2008 AOC, required the PRP to prevent vapor intrusion from occurring into tenant spaces at levels that would not be protective of human health via construction of vapor intrusion mitigation system. The 2008 AOC also required the PRP to perform indoor air monitoring to verify the efficacy of the system. To date, and as described above, the PRP has accomplished the human health protection objectives outlined in the 2008 AOC.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

As described above, the Borough expressed significant concern to EPA with regard to the cost of

operating and maintaining MUN-4, as well as the lack of a redundant well in the Bally public water supply to act as a "back-up" in the event of problems with MUN-4 which cannot be repaired in 24 hours or less. EPA has carefully considered each of these concerns.

With regard to operations and maintenance cost, the Borough had significant input on the construction and connection of MUN-4 to the public water supply. In addition, MUN-4 was built to industry standards, and was issued a permit to operate after inspection by PADEP. EPA believes that terms and cost obligations pertaining to operation and maintenance responsibility for MUN-4 were assumed by the Borough pursuant to a "Water Supply Well Transfer Agreement", dated January 18, 2011. EPA notes that if MUN-4 cannot achieve the water quantity and quality performance standards outlined in the 2007 ROD Amendment, then EPA will take appropriate action to ensure such standards are met.

With regard to the need for a "back-up" well, EPA does consider the remedy protective of human health and the environment, and compliant with applicable Federal and State requirements. EPA notes that if MUN-4 cannot achieve the water quantity and quality performance standards outlined in the 2007 ROD Amendment, then EPA will take appropriate action to ensure such standards are met.

Technical Assessment Summary

The remedy is operating as intended and is protective of human health. The Bally public water supply is no longer impacted by the Site, and workers within the former BES facility are protected from vapor intrusion into their work spaces. However, one of the Remedial Action Objectives is restoration of the impacted aquifer in a reasonable time frame. After 26 years of remediation, ground water contaminant concentrations at the extraction well (MUN-3) are still well above their respective ground water remediation standards. Therefore, optimization of the ground water remedy will be performed to determine an effective approach to achieve the ground water standards for the plume within a reasonable time frame.

VIII. Issues

Table 2 - Issue

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The VOCs concentrations in the ground water plume have decreased, however, after 26 years of treatment the remedial action objective of restoring the aquifer has not been achieved.	N	Y

IX. Recommendation and Follow Up Action

Table 3 - Recommendation

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)
The VOCs concentrations in the ground water plume have decreased, however, after 26 years of treatment the remedial action objective of restoring the aquifer has not been achieved.	Submit a work plan to optimize the ground water remedy to determine an effective approach to achieve the ground water standards for the plume	PRP	EPA	June 2016	Current – No Future – Yes

X. Statement on Protectiveness

The Site consists of three operable units (OUs): the Plume of Ground Water Contamination (OU-1); the Bally public water system (OU-2); and Vapor Intrusion (OU-3).

Because the remedial actions at all OUs are protective, the site is protective of human health and the environment in the short term. When ground water remediation is complete, the site will be protective of human health. To move toward this remedial action objective, optimization of the ground water remedy is recommended.

The ground water remedy is protective of human health and the environment, because exposure pathways have been eliminated; specifically a ground water extraction and treatment system limits the migration of the ground water plume; institutional controls prevent private wells from being installed in the plume; and private wells have not been impacted by the Site. Additionally, discharge from treatment system is meeting the NPDES permit limits, and is protective of human health and the environment.

The water system remedy is protective of human health and the environment, because exposure pathways have been eliminated; specifically, a municipal supply well has been installed in an area which is not impacted by the Site. Water from the municipal well is not contaminated by the Site ground water contamination plume, and is protective of human health.

The vapor intrusion remedy is protective of human health and the environment, because exposure pathways have been eliminated; specifically, a vapor intrusion mitigation system has been constructed at the former BES facility which prevents vapor intrusion into occupational work spaces.

XI. Next Five-Year Review

The next Five-Year Review will be completed no later than five years after the signature date of this Five-Year Review.

Bally Ground Water – 2015 Five Year Review
Attachment 1 Map of facility tenants
Provided by PRP Project Coordinator via email (dated March 13, 2015)

DOGWOOD STREET

Tancredi Machining

Newman Insulation.

IAQ–108

CUTTING EDGE WOODWORKING

IAQ–107

FORMER BES FACILITY

T.G. PACKAGING INC.

FORMER TEST COOLERS

AQDW

FIRE PROTECTION VAULT

TOWNHOME CLUSTER (TYP.)

CHESTN

IAQ–102

IAQ–109

FORMER BES FACILITY

IMPRESS INDUSTRIES

CURRENTLY VACANT

LUCIANA INDUSTRIES

IAQ–103

IAQ–105

FENSTY'S FLEA MARKET

APPROXIMATE LIMIT OF ASPHALT

AQUW

IAQ–101

HUNSINGER PLASTICS

IAQ–104

GREAT AMERICAN WEAVING CORP.

IAQ–106

HUNSINGER OFFICE

OFFICE AREA BASEMENT

GBI BALLY BROOK, INC. CORPORATE CENTER/TENANT OFFICES

PA ROUTE 100

1. Bally Ribbon,
2. Bally Refrigerated Boxes, Inc.
(both companies also occupy some area of this warehousing area with Impress Industries.)

Offices for:
1. Ambient Light, LLC
2. Bally Refrigerated Boxes, Inc.
3. AMEC Alliance
4. Inner Healer Chiropractic
5. Hunsinger Plastic Extrusion (HPE)

LEGEND:

- ORIGINAL PLAN FOR JANUARY 2015 IAQ SAMPLE LOCATIONS (IAQ–101, IAQ–102)
- ADDITIONAL IMPRESS IAQ SAMPLE LOCATION (IAQ–109)
- **ADDITIONAL 2015 IAQ SAMPLING LOCATIONS (IAQ-105 AND IAQ-106)**
- STREAM
- V VENT OR VENT FAN
- H OVERHEAD HEATING UNIT
- S SPRINKLER LINE THROUGH FLOOR
- W WATER LINE
- WOOD FLOOR UNDERLAIN BY CONCRETE
- STORM DRAIN
- S SUMP

0 120
SCALE

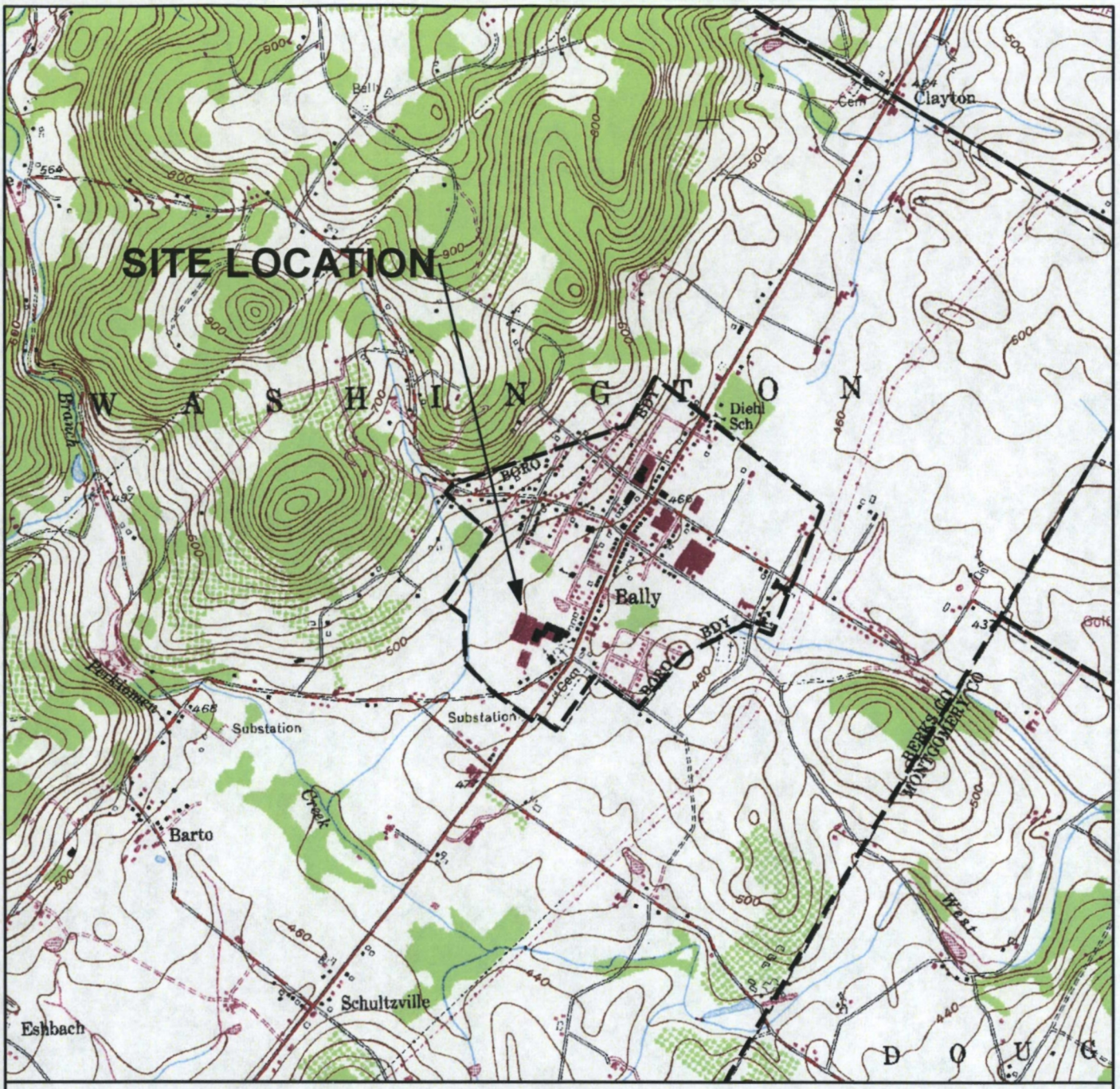
AMERICAN HOUSEHOLD, INC. FORMER BES FACILITY
BALLY BOROUGH BERKS COUNTY, PENNSYLVANIA

JANUARY 2015 TENANT LOCATION SKETCH

ARCADIS

FIGURE 1

Bally Ground Water – 2015 Five Year Review
Attachment 2 Site Plan
Adopted from Remedial Action Progress Report, dated December 8, 2014

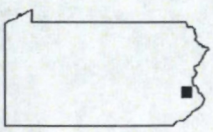


SCALE 1:24000

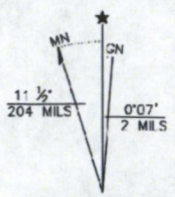
1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER



QUADRANGLE LOCATION



UTM GRID AND 1985 MAGNETIC NORTH

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCE: USGS 7.5 MIN TOPOGRAPHICAL QUADRANGLES
PHILADELPHIA, PENNSYLVANIA 1967, PHOTOREVISED 1985.

BALLY GROUNDWATER CONTAMINATION SITE
BALLY, PENNSYLVANIA
REMEDIAL ACTION PROGRESS REPORT

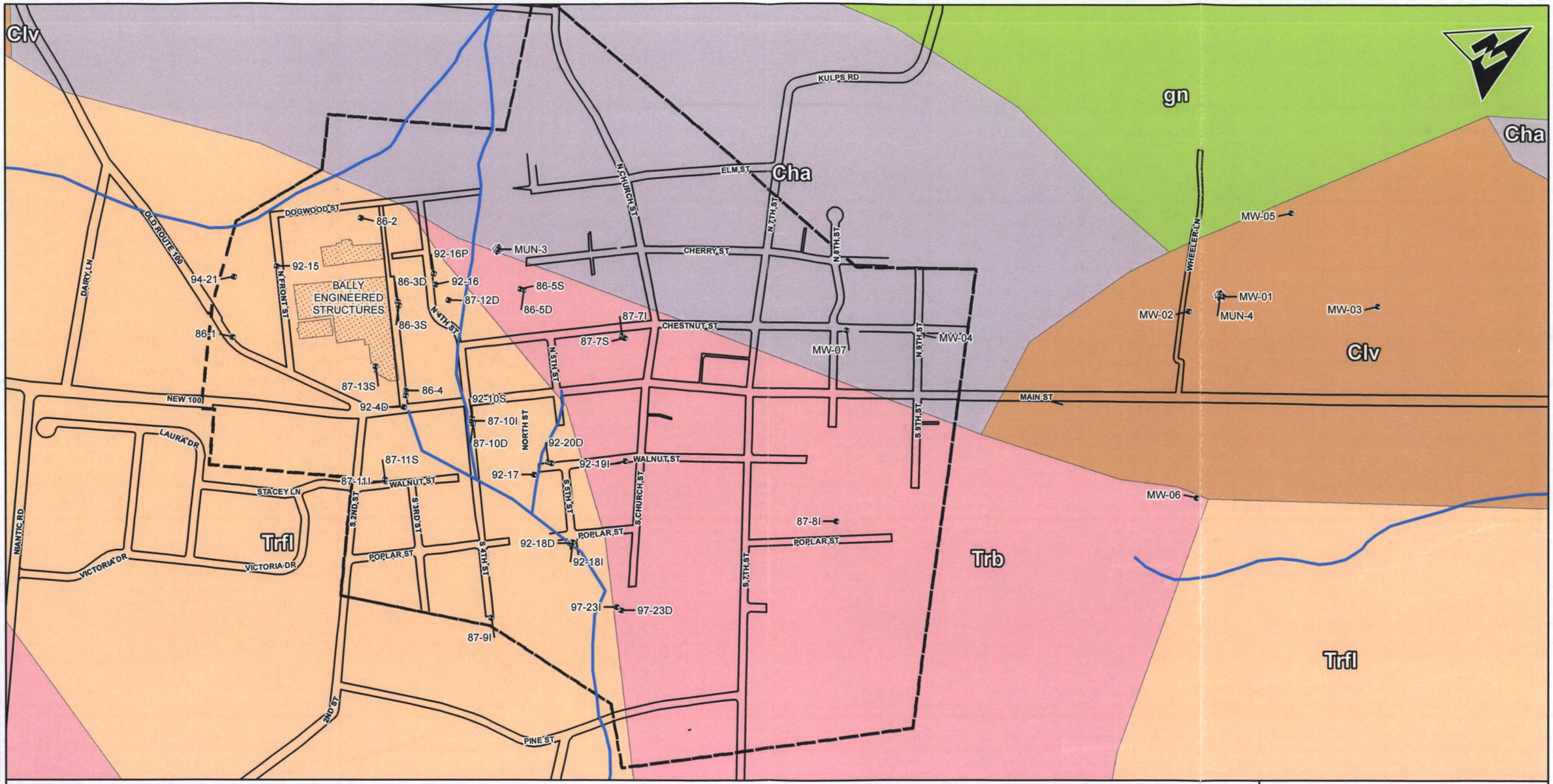
SITE LOCATION

ARCADIS

FIGURE 1

City: NEWTOWN Div/Group: ENV Created By: S. LAMONTE Last Saved By: slamonte BALLY GROUNDWATER SITE (NP000597)
\\PA01FP01\Data\APROJECT\AH Bally, PA\GIS\Mapping Files\FIG-01 SITE LOCATION.mxd 4/7/2014 2:44:17 PM

Bally Ground Water – 2015 Five Year Review
Attachment 3 Map depicting monitoring well locations
Adopted from Remedial Action Progress Report, dated December 8, 2014



LEGEND

REGIONAL GEOLOGY

- Cha - HARDYSTON FORMATION
  QUARTZITE, FELDSPATHIC SANDSTONE, QUARTZ-PEBBLE CONGLOMERATE
- Clv - LEITHSVILLE FORMATION
  DOLOMITE, SHALY DOLOMITE, CHERT; SHALE
- Trb - BRUNSWICK FORMATION
  MUDSTONE, SILTSTONE, SHALE; ARGILLITE
- Trfl - LIMESTONE FANGLOMERATE
  LIMESTONE CONGLOMERATE
- gn - GNEISS BEDROCK BASEMENT
  FELSIC TO MAFIC GNEISS

- MONITORING WELL
- MUNICIPAL WELL
- SURFACE WATER

0 300 600 1,200
SCALE IN FEET

NOTES

1) DIGITAL GEOLOGY MAP DOWNLOADED FROM PENNSYLVANIA DEPARTMENT OF CONSERVATION OF NATURAL RESOURCES INTERNET DATABASE:

GEOLOGIC MAP OF PENNSYLVANIA, COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL RESOURCES, 1980.

BALLY GROUNDWATER CONTAMINATION SITE
BALLY, PENNSYLVANIA
REMEDIAL ACTION PROGRESS REPORT

SITE LAYOUT AND REGIONAL GEOLOGY

ARCADIS

FIGURE 2

City: NEWTOWN Div/Group: ENV Created By: S. LAMONTE Last Saved By: slamonte BALLY GROUNDWATER SITE (NP000597)
WPA01FP01\Data\APROJECT\VH Bally, PA\GIS\Mapping Files\FIG-02 SITE LAYOUT.mxd 6/9/2014 1:44:53 PM

Bally Ground Water – 2015 Five Year Review
Attachment 4 Map depicting most recent ground water data – Sentry Monitoring
Adopted from Remedial Action Progress Report, dated December 8, 2014

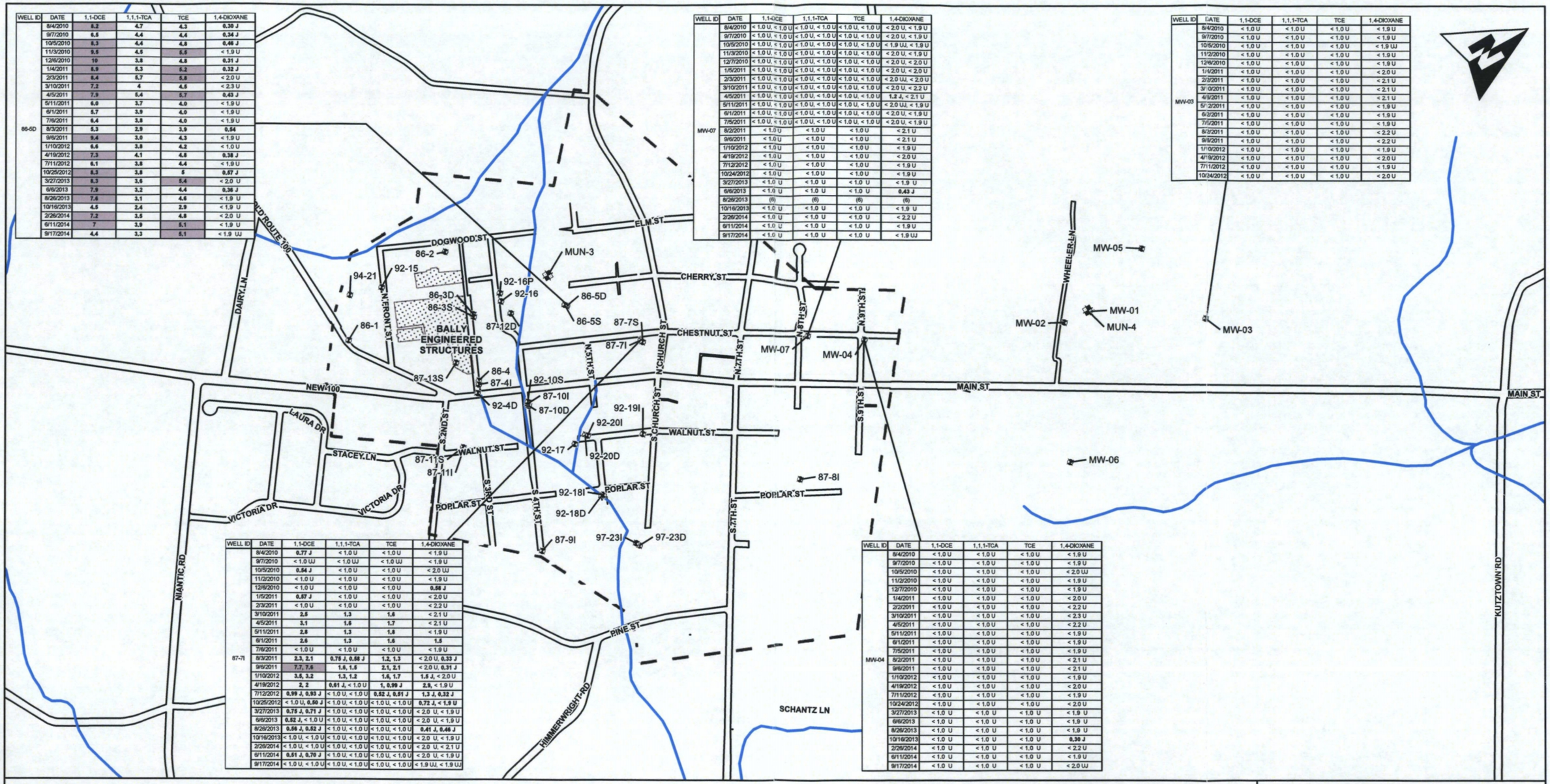
WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
86-5D	8/4/2010	8.2	4.7	4.3	0.30 J
	9/7/2010	8.8	4.4	4.4	0.34 J
	10/5/2010	8.3	4.4	4.8	0.46 J
	11/3/2010	9.8	4.9	5.8	< 1.9 U
	12/6/2010	10	3.8	4.8	0.31 J
	1/4/2011	8.9	5.3	5.2	0.32 J
	2/3/2011	8.4	5.7	5.8	< 2.0 U
	3/10/2011	7.2	4	4.5	< 2.3 U
	4/5/2011	7.9	5.4	5.7	0.43 J
	5/11/2011	6.0	3.7	4.0	< 1.9 U
	6/1/2011	5.7	3.9	4.0	< 1.9 U
	7/6/2011	6.4	3.8	4.0	< 1.9 U
	8/3/2011	5.3	2.9	3.9	0.54
	9/6/2011	9.4	3.0	4.3	< 1.9 U
	1/10/2012	6.6	3.8	4.2	< 1.0 U
	4/19/2012	7.3	4.1	4.8	0.38 J
	7/11/2012	6.1	3.8	4.4	< 1.9 U
	10/25/2012	8.3	3.8	5	0.57 J
	3/27/2013	8.3	3.6	5.4	< 2.0 U
	6/6/2013	7.9	3.2	4.4	0.36 J
	8/26/2013	7.6	3.1	4.6	< 1.9 U
	10/16/2013	4.8	2.4	2.9	< 1.9 U
	2/26/2014	7.2	3.5	4.8	< 2.0 U
	6/11/2014	7	3.9	5.1	< 1.9 U
	9/17/2014	4.4	3.3	5.1	< 1.9 UJ

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
MW-07	8/4/2010	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	9/7/2010	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	10/5/2010	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.9 UJ, < 1.9 U
	11/3/2010	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	12/7/2010	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 2.0 U
	1/5/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 2.0 U
	2/3/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 UJ, < 2.0 U
	3/10/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 2.2 U
	4/5/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	1.2 J, < 2.1 U
	5/11/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 UJ, < 1.9 U
	6/1/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	7/5/2011	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	8/2/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	9/6/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	1/10/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	4/19/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	7/12/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/24/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	3/27/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	6/6/2013	< 1.0 U	< 1.0 U	< 1.0 U	0.43 J
	8/26/2013	(6)	(6)	(6)	(6)
	10/16/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	2/26/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	6/11/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	9/17/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 UJ

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
MW-03	8/4/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	9/7/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/5/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 UJ
	11/2/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	12/6/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	1/4/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	2/2/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	3/10/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	4/5/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	5/12/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	6/2/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	7/5/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	8/3/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	9/9/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	10/3/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	4/19/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	7/11/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/24/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
87-7I	8/4/2010	0.77 J	< 1.0 U	< 1.0 U	< 1.9 U
	9/7/2010	< 1.0 UJ	< 1.0 UJ	< 1.0 UJ	< 1.9 U
	10/5/2010	0.54 J	< 1.0 U	< 1.0 U	< 2.0 UJ
	11/2/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	12/6/2010	< 1.0 U	< 1.0 U	< 1.0 U	0.58 J
	1/5/2011	0.57 J	< 1.0 U	< 1.0 U	< 2.0 U
	2/3/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	3/10/2011	2.5	1.3	1.6	< 2.1 U
	4/5/2011	3.1	1.6	1.7	< 2.1 U
	5/11/2011	2.8	1.3	1.8	< 1.9 U
	6/1/2011	2.6	1.3	1.6	1.5
	7/6/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	8/3/2011	2.3, 2.1	0.75 J, 0.58 J	1.2, 1.3	< 2.0 U, 0.33 J
	9/6/2011	7.7, 7.6	1.6, 1.5	2.1, 2.1	< 2.0 U, 0.31 J
	1/10/2012	3.5, 3.2	1.3, 1.2	1.6, 1.7	1.5 J, < 2.0 U
	4/19/2012	2, 2	0.61 J, < 1.0 U	1, 0.99 J	2.9, < 1.9 U
	7/12/2012	0.99 J, 0.93 J	< 1.0 U, < 1.0 U	0.52 J, 0.51 J	1.3 J, 0.32 J
	10/25/2012	< 1.0 U, 0.50 J	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	0.72 J, < 1.9 U
	3/27/2013	0.75 J, 0.71 J	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	6/6/2013	0.52 J, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	8/26/2013	0.56 J, 0.52 J	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	0.41 J, 0.46 J
	10/16/2013	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	2/26/2014	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 2.1 U
	6/11/2014	0.61 J, 0.70 J	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 2.0 U, < 1.9 U
	9/17/2014	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.0 U, < 1.0 U	< 1.9 UJ, < 1.9 UJ

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
MW-04	8/4/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	9/7/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/5/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 UJ
	11/2/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	12/7/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	1/4/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	2/2/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	3/10/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.3 U
	4/5/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	5/11/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	6/1/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	7/5/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	8/2/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	9/6/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U
	1/10/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	4/19/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	7/11/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/24/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	3/27/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	6/6/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	8/26/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	10/16/2013	< 1.0 U	< 1.0 U	< 1.0 U	0.30 J
	2/26/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 2.2 U
	6/11/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	9/17/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 UJ



LEGEND

- MUNICIPAL WELL
- MONITORING WELL
- SURFACE WATER
- BOROUGH OF BALLY

0 400 800 1,600

SCALE IN FEET

NOTES:

1. < 2.0 U = NOT DETECTED ABOVE THE SPECIFIED CONCENTRATION.

2. J = CONSTITUENT CONCENTRATION IS ESTIMATED; VALUE IS BETWEEN THE LABORATORY METHOD DETECTION LIMIT AND THE REPORTING LIMIT.

3. ALL DETECTIONS ARE BOLDFACED. GREY SHADED VALUES EXCEED THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY MAXIMUM CONTAMINANT LEVELS (MCL) AS FOLLOWS:

COMPOUND	ABBREVIATION	MCL
1,1-DICHLOROETHENE	1,1-DCE	7
1,1,1-TRICHLOROETHANE	1,1,1-TCA	200
TRICHLOROETHENE	TCE	5
1,4-DIOXANE	1,4-DIOXANE	3

4. ALL CONCENTRATIONS ARE IN MICROGRAMS PER LITER.

5. DUPLICATE SAMPLE RESULTS ARE PRESENTED ALONGSIDE THE PARENT SAMPLE RESULTS.

6. WELL MW-07 HAD A BROKEN AIR VALVE FITTING IN THE DEDICATED WELL PUMP MOUNT AND COULD NOT BE SAMPLED DURING THE AUGUST 2013 SAMPLING EVENT.

BALLY GROUNDWATER CONTAMINATION SITE
BALLY, PENNSYLVANIA
REMEDIAL ACTION PROGRESS REPORT

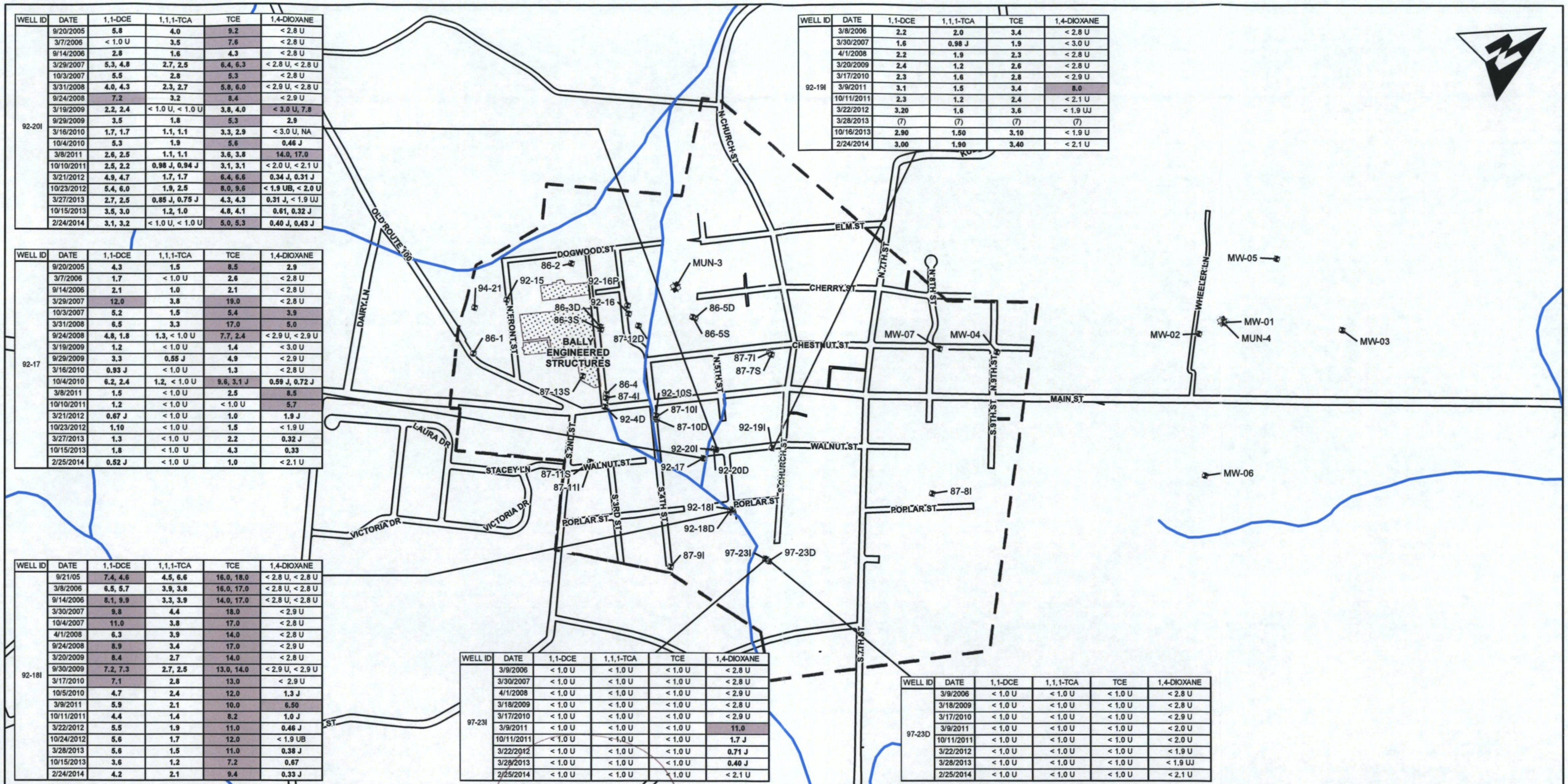
SENTRY MONITORING ANALYTICAL RESULTS

ARCADIS

FIGURE 4-B

City: NEWTOWN Div/Group: ENV Created By: S. LAMONTE Last Saved By: slamonte BALLY GROUNDWATER SITE (NP000597)
\\PA01FP01\Data\APROJECT\AH Bally, PA\GIS\Mapping Files\FIG-4B SENTRY DATABOXES.mxd 12/8/2014 4:43:43 PM

Bally Ground Water – 2015 Five Year Review
Attachment 5 Map depicting most recent ground water data – Southern Area Monitoring
Adopted from Remedial Action Progress Report, dated December 8, 2014



WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
92-20I	9/20/2005	5.8	4.0	9.2	< 2.8 U
	3/7/2006	< 1.0 U	3.5	7.6	< 2.8 U
	9/14/2006	2.8	1.6	4.3	< 2.8 U
	3/29/2007	5.3, 4.8	2.7, 2.5	6.4, 6.3	< 2.8 U, < 2.8 U
	10/3/2007	5.5	2.8	5.3	< 2.8 U
	3/31/2008	4.0, 4.3	2.3, 2.7	5.8, 6.0	< 2.9 U, < 2.8 U
	9/24/2008	7.2	3.2	8.4	< 2.9 U
	3/19/2009	2.2, 2.4	< 1.0 U, < 1.0 U	3.8, 4.0	< 3.0 U, 7.8
	9/29/2009	3.5	1.8	5.3	2.9
	3/16/2010	1.7, 1.7	1.1, 1.1	3.3, 2.9	< 3.0 U, NA
	10/4/2010	5.3	1.9	5.6	0.46 J
	3/8/2011	2.6, 2.5	1.1, 1.1	3.6, 3.8	14.0, 17.0
	10/10/2011	2.5, 2.2	0.98 J, 0.94 J	3.1, 3.1	< 2.0 U, < 2.1 U
	3/21/2012	4.9, 4.7	1.7, 1.7	6.4, 6.6	0.34 J, 0.31 J
	10/23/2012	5.4, 6.0	1.9, 2.5	8.0, 9.6	< 1.9 UB, < 2.0 U
	3/27/2013	2.7, 2.5	0.85 J, 0.75 J	4.3, 4.3	0.31 J, < 1.9 UJ
	10/15/2013	3.5, 3.0	1.2, 1.0	4.8, 4.1	0.61, 0.32 J
	2/24/2014	3.1, 3.2	< 1.0 U, < 1.0 U	5.0, 5.3	0.40 J, 0.43 J

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
92-17	9/20/2005	4.3	1.5	8.5	2.9
	3/7/2006	1.7	< 1.0 U	2.6	< 2.8 U
	9/14/2006	2.1	1.0	2.1	< 2.8 U
	3/29/2007	12.0	3.8	19.0	< 2.8 U
	10/3/2007	5.2	1.5	5.4	3.9
	3/31/2008	6.5	3.3	17.0	5.0
	9/24/2008	4.8, 1.8	1.3, < 1.0 U	7.7, 2.4	< 2.9 U, < 2.9 U
	3/19/2009	1.2	< 1.0 U	1.4	< 3.0 U
	9/29/2009	3.3	0.55 J	4.9	< 2.9 U
	3/16/2010	0.93 J	< 1.0 U	1.3	< 2.8 U
	10/4/2010	6.2, 2.4	1.2, < 1.0 U	9.6, 3.1 J	0.59 J, 0.72 J
	3/8/2011	1.5	< 1.0 U	2.5	8.5
	10/10/2011	1.2	< 1.0 U	< 1.0 U	5.7
	3/21/2012	0.67 J	< 1.0 U	1.0	1.9 J
	10/23/2012	1.10	< 1.0 U	1.5	< 1.9 U
	3/27/2013	1.3	< 1.0 U	2.2	0.32 J
	10/15/2013	1.8	< 1.0 U	4.3	0.33
	2/25/2014	0.52 J	< 1.0 U	1.0	< 2.1 U

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
92-18I	9/21/05	7.4, 4.6	4.5, 6.6	16.0, 18.0	< 2.8 U, < 2.8 U
	3/8/2006	6.5, 5.7	3.9, 3.8	16.0, 17.0	< 2.8 U, < 2.8 U
	9/14/2006	8.1, 9.9	3.3, 3.9	14.0, 17.0	< 2.8 U, < 2.8 U
	3/30/2007	9.8	4.4	18.0	< 2.9 U
	10/4/2007	11.0	3.8	17.0	< 2.8 U
	4/1/2008	6.3	3.9	14.0	< 2.8 U
	9/24/2008	8.9	3.4	17.0	< 2.9 U
	3/20/2009	8.4	2.7	14.0	< 2.8 U
	9/30/2009	7.2, 7.3	2.7, 2.5	13.0, 14.0	< 2.9 U, < 2.9 U
	3/17/2010	7.1	2.8	13.0	< 2.9 U
	10/5/2010	4.7	2.4	12.0	1.3 J
	3/9/2011	5.9	2.1	10.0	6.50
	10/11/2011	4.4	1.4	8.2	1.0 J
	3/22/2012	5.5	1.9	11.0	0.46 J
	10/24/2012	5.6	1.7	12.0	< 1.9 UB
	3/28/2013	5.6	1.5	11.0	0.38 J
	10/15/2013	3.6	1.2	7.2	0.67
	2/24/2014	4.2	2.1	9.4	0.33 J

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
92-19I	3/8/2006	2.2	2.0	3.4	< 2.8 U
	3/30/2007	1.6	0.98 J	1.9	< 3.0 U
	4/1/2008	2.2	1.9	2.3	< 2.8 U
	3/20/2009	2.4	1.2	2.6	< 2.8 U
	3/17/2010	2.3	1.6	2.8	< 2.9 U
	3/9/2011	3.1	1.5	3.4	8.0
	10/11/2011	2.3	1.2	2.4	< 2.1 U
	3/22/2012	3.20	1.6	3.6	< 1.9 UJ
	3/28/2013	(7)	(7)	(7)	(7)
	10/16/2013	2.90	1.50	3.10	< 1.9 U
	2/24/2014	3.00	1.90	3.40	< 2.1 U

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
97-23I	3/9/2006	< 1.0 U	< 1.0 U	< 1.0 U	< 2.8 U
	3/30/2007	< 1.0 U	< 1.0 U	< 1.0 U	< 2.8 U
	4/1/2008	< 1.0 U	< 1.0 U	< 1.0 U	< 2.9 U
	3/18/2009	< 1.0 U	< 1.0 U	< 1.0 U	< 2.8 U
	3/17/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 2.9 U
	3/9/2011	< 1.0 U	< 1.0 U	< 1.0 U	11.0
	10/11/2011	< 1.0 U	< 1.0 U	< 1.0 U	1.7 J
	3/22/2012	< 1.0 U	< 1.0 U	< 1.0 U	0.71 J
	3/28/2013	< 1.0 U	< 1.0 U	< 1.0 U	0.40 J
	2/25/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U

WELL ID	DATE	1,1-DCE	1,1,1-TCA	TCE	1,4-DIOXANE
97-23D	3/9/2006	< 1.0 U	< 1.0 U	< 1.0 U	< 2.8 U
	3/18/2009	< 1.0 U	< 1.0 U	< 1.0 U	< 2.8 U
	3/17/2010	< 1.0 U	< 1.0 U	< 1.0 U	< 2.9 U
	3/9/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	10/11/2011	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
	3/22/2012	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 U
	3/28/2013	< 1.0 U	< 1.0 U	< 1.0 U	< 1.9 UJ
	2/25/2014	< 1.0 U	< 1.0 U	< 1.0 U	< 2.1 U

LEGEND

- MUNICIPAL WELL
- MONITORING WELL
- SURFACE WATER
- BOROUGH OF BALLY

NOTES:

1. < 2.0 U = NOT DETECTED ABOVE THE SPECIFIED CONCENTRATION.

2. J = CONSTITUENT CONCENTRATION IS ESTIMATED; VALUE IS BETWEEN THE LABORATORY METHOD DETECTION LIMIT AND THE REPORTING LIMIT.

3. ALL DETECTIONS ARE BOLDFACED. GREY SHADED VALUES EXCEED THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY MAXIMUM CONTAMINANT LEVELS (MCL) AS FOLLOWS:

COMPOUND	ABBREVIATION	MCL
1,1-DICHLOROETHENE	1,1-DCE	7
1,1,1-TRICHLOROETHANE	1,1,1-TCA	200
TRICHLOROETHENE	TCE	5
1,4-DIOXANE	1,4-DIOXANE	3

4. ALL CONCENTRATIONS ARE IN MICROGRAMS PER LITER.

5. DUPLICATE SAMPLE RESULTS ARE PRESENTED ALONGSIDE THE PARENT SAMPLE RESULTS.

6. MONITORING WELLS 92-19I, 92-23I, AND 92-23D ARE NOT SAMPLED DURING THE OCTOBER SEMI-ANNUAL MONITORING PROGRAM. THEY WERE INADVERTENTLY SAMPLED IN OCTOBER 2011.

7. MONITORING WELL 92-19I WAS NOT ACCESSIBLE DURING THE MARCH 2013 SAMPLING EVENT

BALLY GROUNDWATER CONTAMINATION SITE
BALLY, PENNSYLVANIA
REMEDIAL ACTION PROGRESS REPORT

SOUTHERN AREA MONITORING ANALYTICAL RESULTS

ARCADIS

FIGURE 4-A

City: NEWTOWN Div/Group: ENV Created By: S. LAMONTE Last Saved By: slamonte BALLY GROUNDWATER SITE (NP000597)
\\PA01FP01\Data\APROJECT\AH Bally, PA\GIS\Mapping Files\FIG-4A SAM DATABOXES.mxd 6/10/2014 9:06:34 AM

Bally Ground Water – 2015 Five Year Review
Attachment 6 Performance Standards table
Adopted from Record of Decision, dated June 30, 1989

TABLE 2

REMEDIATION AND DISCHARGE LIMITS DERIVED FROM ARARS

CONTAMINANT CONCENTRATION ARARs (ppm)

MEDIUM	TCE	TCA	DCE	PCE	METHYLENE CHLORIDE	1,1-DCA	1,2-DCA
Ground Water	0.005 (MCL)(1)	0.2 (MCL)	0.007 (MCL)	0.005 (PMCL)(2)	0.005 (RSD)(3)	NE (4)	NE
Treated Ground Water	0.001 (MWS)(5)	0.2 (MWS/MCL)	0.007 (MWS/MCL)	NE	NE	NE	NE
Surface Water	0.033 (NPDES)(6)	Monitor Only (NPDES)	0.00063 (NPDES)	0.0014 (NPDES)	Monitor Only (NPDES)	Monitor Only (NPDES)	Monitor Only (NPDES)

(1) MCL - Maximum Contaminant Level

(2) PMCL - Proposed MCL

(3) RSD - Risk Specific Dose

(4) NE - None Established: These compounds have not been detected in Municipal Well No. 3

(5) MWS - Municipal Water Supply Permit

(6) NPDES - National Pollutant Discharge Elimination System Permit

Bally Ground Water – 2015 Five Year Review
Attachment 7 Monitoring well sampling schedule
Adopted from Remedial Action Progress Report, dated December 8, 2014

ARCADIS

Table 1. Well Construction Details and Sampling Program Summary
Bally Groundwater Contamination Site, Berks County, Pennsylvania

Well ID	Installation Date	Purpose	Total Depth of Casing (feet bgs)	Construction Details	Diameter (inches)	Total Well Depth (feet bgs)	Monitoring Interval (feet bgs)	Monitored Hydrogeologic Unit	Sentry Sampling Frequency	Sentry Monitoring Pump Intake (feet bgs)	Southern Area Monitoring Sampling Frequency
86-1	April 1986	Monitoring	8	NA	NA	47.6	8.0-48.0	Brunswick	--	--	--
86-2	May 1986	Monitoring	29	PVC	2	49.2	29.0-49.0	Brunswick	--	--	--
86-3S	April 1986	Monitoring	15	Steel	6	44.5	15.0-45.0	Brunswick	--	--	--
86-3D	April 1986	Monitoring	97	Steel	6	146.7	97.0-146.7	Brunswick	--	--	--
86-4	April 1986	Monitoring	11	Sch-40 PVC	4	41.4	11.0-41.0	Brunswick	--	--	--
87-4I	December 1987	Monitoring	60	Steel	6	120.0	60.0-120	Brunswick	--	--	--
92-4D	February 1993	Monitoring	221.4	Sch-40 PVC	2	241.4	221.4-241.4	Brunswick	--	--	--
86-5S	April 1986	Monitoring	34	Steel	6	64.5	34.0-64.0	Brunswick	--	--	--
86-5D	April 1986	Monitoring	112	Steel	6	164.8	112.0-164.8	Brunswick	Quarterly	159	--
87-7S	November 1987	Monitoring	26	Sch-40 PVC	2	40.6	26.0-40.6	Brunswick	--	--	--
87-7I	November 1987	Monitoring	102	Steel	6	132.5	102.0-132.0	Brunswick	Quarterly	95	--
87-8I	December 1987	Monitoring	60	Steel	6	132.8	60.0-129.8	Brunswick	--	--	--
87-9I	November 1987	Monitoring	NA	Steel	6	177.5	100.0-177.5	Brunswick	--	--	--
92-10S	January 1993	Monitoring	11.5	Sch-40 PVC	2	31.5	11.5-31.5	Brunswick	--	--	--
87-10I	December 1987	Monitoring	60	Steel	6	120.9	60.0-119.3	Brunswick	--	--	--
87-10D	December 1987	Monitoring	NA	Steel	6	211.0	150.0-211.0	Brunswick	--	--	--
87-11S	December 1987	Monitoring	20	Steel	6	41.7	20.0-40.0	Brunswick	--	--	--
87-11I	December 1987	Monitoring	70	Steel	6	132.7	70.0-132.7	Brunswick	--	--	--
87-12D	December 1987	Monitoring	NA	Steel	6	203.3	163.0-203.3	Brunswick	--	--	--
87-13S	December 1987	Monitoring	11.5	Sch-40 PVC	2	21.5	11.5-21.5	Brunswick	--	--	--
92-15	January 1993	Monitoring	160	Sch-40 PVC	2	180.0	160.0-180.0	Brunswick	--	--	--
92-16P	June 1993	Monitoring	302	Sch-40 PVC	2	322.0	302.0-322.0	Brunswick	--	--	--
92-16	June 1993	Monitoring	420	Sch-40 PVC	2	441.4	420.0-440.0	Brunswick	--	--	--
92-17	March 1993	Monitoring	52	Steel	6	440.0	52.0-440.0	Brunswick	--	--	Semi-annually
92-18I	November 1993	Monitoring	60	Sch-40 PVC	2	120.0	60.0-120.0	Brunswick	--	--	Semi-annually
92-18D	June 1993	Monitoring	265.5	Sch-40 PVC	2	285.5	265.5-285.5	Brunswick	--	--	--
92-19I	May 1993	Monitoring	170	Sch-40 PVC	2	190.0	170.0-190.0	Brunswick	--	--	Annually
92-20I	November 1993	Monitoring	58	Sch-40 PVC	2	118.0	58.0-118.0	Brunswick	--	--	Semi-annually
92-20D	November 1993	Monitoring	299.2	Sch-40 PVC	2	319.2	299.2-319.2	Brunswick	--	--	--
94-21	June 1994	Monitoring	NA	Sch-40 PVC	2	180.0	NA-180.0	Brunswick	--	--	--
97-23D	September 1998	Monitoring	260	Sch-40 PVC	2	280.0	260.0-280.0	Brunswick	--	--	Annually
97-23I	September 1998	Monitoring	90	Sch-40 PVC	2	150.0	90.0-150.0	Brunswick	--	--	Annually
MUN-3	August 1977	Municipal	154	Steel	10	303.0	154.0-303.0	Brunswick	--	--	--
MUN-4 / PW-01	August 2005	Production	170	Steel	8	420.0	170.0 - 420.0	Leithsville	--	--	--
MW-01	June 2005	Observation	160	Steel	6	385.0	165.0-355.0	Leithsville	--	--	--
MW-02	August 2005	Observation	238	Steel	6	285.0	238.0 - 285.0	Leithsville	--	--	--
MW-03*	August 2005	Observation	38	Steel	6	420.0	38.0 - 420.0	Leithsville	Quarterly*	410	--
MW-04	September 2005	Monitoring	120	Steel	6	280.0	120.0 - 280.0	Leithsville	Quarterly	195	--
MW-05	September 2005	Observation	43	Steel	10	130.0	43.0 - 130.0	Gneiss	--	--	--
MW-06	October 2005	Observation	66	Steel	6	300.0	66.0-300.0	Brunswick	--	--	--
MW-07	November 2006	Monitoring	311	Sch-40 PVC	2	331.0	311.0 - 331.0	Leithsville	Quarterly	321	--

Notes:
bgs below ground surface
* Sentry Monitoring of monitoring well MW-3 ceased in 2013 with the removal of the dedicated pump system from the well on January 25, 2013.
NA Not available